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ACTIVITIES OF THE GULF COAST RESEARCH LABORATORY DURING FISCAL YEAR 1977–78: A SUMMARY REPORT

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ADMINISTRATION

During the year, the Gulf Coast Research Laboratory (GCRL) was the recipient of several significant gifts. These were the following: a 26-foot Lafitte skiff, powered by a 6-cylinder, 135-horsepower Palmer engine, valued at $7,000 and donated by Mr. Cyril R. Laan of Ocean Springs and New Orleans; 33 acres of Sioux Bayou marsh lands valued at $11,000 and donated by Tri-Land Development, Inc., Pascagoula; and a small wooden building valued at $10,000 from Keesler Air Force Base donated by the U.S. Department of Health, Education and Welfare. Additionally, two and one-half acres of property adjacent to the campus was purchased, including a small, wood-frame house.

The annual State appropriation for the general support of the Laboratory was $1,780,500. An additional $25,000 was received through a Special Library Improvement Allocation by the 1977 State Legislature and $672,468 was generated through sponsored research.

BOAT OPERATIONS

The boats that provide essential services include the 65-foot R/V GULF RESEARCHER, used in both the Laboratory's research and educational programs; the 38-foot steel trawler HERMES, used principally in the educational program; three diesel-powered cabin workboats; and some half-dozen Boston Whalers and other miscellaneous smaller boats operated on a part-time basis by scientists and technicians to meet the needs of Laboratory research projects.

During the year ended June 30, 1978, R/V GULF RESEARCHER was at sea for 61 days and 24 nights. HERMES spent 59 days at sea and the smaller boats made innumerable trips over the same period.

RESEARCH

ANADROMOUS FISHES SECTION, Dr. Thomas D. McIlwain, Head

Rearing and Stocking Striped Bass – Mississippi Gulf Coast (Funded by National Marine Fisheries Services [NMFS], U.S. Fish and Wildlife Service and GCRL): The second segment of the project dealing with the rearing and stocking of striped bass was begun in September 1977. The objectives of this program are to establish, by stocking, a striped bass population in Biloxi Bay; to stock sea-run striped bass and determine their success; and to establish a source of fry from Mississippi brood fish.

Approximately 582,000 striped bass of South Carolina origin were reared to a size of 2 inches and stocked into Biloxi Bay. Some 145,400 of these fish were reared from eggs taken from Mississippi brood fish. These brood fish were taken from Pearl River near Jackson, Mississippi, by Mississippi Game and Fish Commission (MGFC) personnel and transported to GCRL for spawning. Out of eight eligible females, four were tank spawned, three successfully. The successful spawn resulted in 1.7 million fry. One million were returned to MGFC for rearing and the remaining 700,000 were retained at GCRL for rearing.

No sea-run striped bass were stocked in this segment due to the unavailability of fry from sea-run stocks.

A total of 66 striped bass which were stocked in previous years were returned to project personnel. These fish ranged in weight from one-half pound to 19 pounds.

A sampling program is in progress to check for natural reproduction of previously stocked bass and for occurrence of juvenile striped bass, and to monitor previously stocked striped bass in order to continue assessing the results of all bass-stocking programs previously carried out in this area.

Bait Fish Rearing (Funded by Mississippi Marine Resources Council [MMRC]): A handbook was developed detailing the techniques for rearing bullminnows in closed systems and in ponds to supply the live-bait industry along the coast. The bullminnow is a favorite live-bait when available to coastal sport fishermen. Supplies are quickly depleted in late fall when the spotted seatrout (*Cynoscion nebulosus*) are running.

Sporting Analysis of St. Louis Bay (Funded by E. I. duPont de Nemours & Company, Inc. [Du Pont]): This program began in December 1977 and will continue for one year. The work entails gathering data on the total effort expended and total harvest of sport fish caught in St. Louis Bay. Data gathered will detail species composition, seasonal and numerical abundance, as well as size composition and method of capture and catch per unit of effort.

A Proposed Mississippi Marine Finfish (Selected) Fishery Management Plan (Funded by Mississippi-Alabama Sea Grant Program [M-ASGP]): As one of the five Gulf of Mexico states, Mississippi plays an integral role in the Gulf states fisheries. With a shoreline of only 70 miles, Mississippi ranks second in the total volume of seafood landed in these five states. Because of increasing national and international emphasis on fisheries and fishery management plans being developed, it has become more and more important for the

states to improve their management technique in this area. In essence, the states are the key to the regional and national success of our fisheries from all standpoints—biological, economic, social, environmental, administrative, etc. An improved finfish management system in Mississippi will not only improve the Mississippi output and conservation of the resource, but will contribute to improving both the Gulf regional fishery and the national fishery. A carefully developed and organized management plan for Mississippi does not exist at this time.

ANALYTICAL CHEMISTRY SECTION, Dr. Thomas F. Lytle, Head

Heavy Metals in St. Louis Bay (Funded by Du Pont): Because heavy metals pose a potential threat to estuarine water, whether coastal areas are developed industrially or residentially, an assessment of heavy metals is being conducted in St. Louis Bay where very little of either type development exists. Heavy metals are being examined in as many of the environmental components of the bay as possible. Because heavy metals may exist in the water column either in the soluble form or as particulate, both forms are being analyzed. The eventual repository for heavy metals is the sedimentary bed; sediments which will reflect a combined history of heavy metal input for as long a period as sampling will allow are good candidates for monitoring past exposure to heavy metals. Organisms may concentrate heavy metals either by absorption or ingestion from water or sediments. These concentrations may escalate to levels that are harmful to the organism, to its predator or man. The concentration of heavy metals in the tissues of organisms does not fluctuate quite so drastically as in the water nor remain as stable as in the sediments. However, because any grossly elevated levels of heavy metals would be of more immediate harm to organisms than to sediments, we need to know more about the heavy metal budget in the Bay.

A survey, to adequately describe heavy metals in bay waters, should include a constant monitoring of metals in many locations for a period of several years. This approach is presently not feasible even on a small scale; therefore, we must be satisfied to collect water samples that will give at least typical values for the Bay. Eight stations have been selected for heavy metal collections from among 11 stations used for nutrient studies. These stations are being occupied once every second month for the purpose of making a collection sufficiently large to measure the following 17 metals: copper, chromium, cobalt, nickel, zinc, cadmium, iron, titanium, vanadium, mercury, arsenic, selenium, antimony, strontium, molybdenum, beryllium, and lead, plus cyanide. The sampling does not coincide with any other sampling effort in order to avoid any contamination from the research boats in the Bay. The samples have been filtered, preserved and frozen, then transported to the Laboratory for analysis. Sediments from these eight stations and six more have also been collected. An assortment of resident species of fish and invertebrates are being collected for dissection and analysis. Marsh soils and plants will also be analyzed.

Of prime concern has been the construction of a "clean" laboratory for trace metal analysis. All metallic objects were removed if feasible, and if not, coated with epoxy. Separated from the hall by an outer office, the clean area was sealed with epoxy paints and other plastic sealants and is supplied with constant, positive-pressure, ultrafiltered air. A Teflon-clean bench-hood for critical sample treatments and a fused-quartz still for final water distillations were installed. Ceiling tiles were replaced with plastic panels cemented in place. Since debris from corroded surfaces or dust from any source could seriously compromise trace metal results, all efforts are being made to prevent these from occurring in the laboratory.

When analyses are complete, the present load of heavy metals in St. Louis Bay should be known with a fair degree of certainty.

Nutrients in St. Louis Bay (Funded by Du Pont): A program was designed to determine the levels and distribution of nutrients in St. Louis Bay. Later it was decided that the term nutrients was misleading; therefore, the measurements are now referred to as water quality parameters (WQP). Envisioned originally as measurements to support other studies in the Bay, this concept was soon abandoned because of the difficulties of coordinating all possible interests with the WQP samples. Because it appeared that productivity measurements would suffer most from lack of synopticity with that collection, samples for WQP were collected in a manner to achieve results that might be directly correlated. The parameters chosen were: orthophosphate, total phosphorus, nitrate, nitrite, ammonia, chloride, sulfate, suspended solids, turbidity, alkalinity and silica. In addition, samples were also collected for total inorganic and organic carbon and distributed to the Environmental Chemistry Section.

The methods used for analysis were those in the *Federal Register*, December 1976. Though these methods have proved defective in some respects, matrix modifications in samples and standards have almost without exception proven them to be reliable. The only measurement remaining an enigma is that of total phosphorus. Water samples are collected once monthly in a manner to preserve the integrity of the samples for all WQP. Initially, samples for all parameters were collected and preserved individually. However, this procedure proved very time-consuming and inept. Therefore, to collect samples as quickly as possible (to remove the time factor in station comparisons), one sample bottle is now used for all parameters. These samples, preserved on ice, are rushed back to the Water Analysis Laboratory for processing. This sampling procedure has worked better than a field-based procedure.

Eleven stations are sampled in this study including some in the Bay proper, others near residential areas, in large bayous and both the Jourdan and Wolfe rivers. Surface samples are collected at all stations each month; in addition, at half of the stations, vertical profiles of water quality parameters

are made when depths permit. Correlations of the various parameters are being made; nutrient budgets are being established and overall water quality evaluated in St. Louis Bay.

Techniques Development for Oil Pollution Assessment (Funded by GCRL and the Bureau of Land Management): This is a continued study designed to find the best procedures both to chemically analyze geological and biological samples and to assess the proper parameters by which to designate whether or not the samples are polluted with petroleum hydrocarbons. Sediment samples, taken before emplacement, during drilling and after drilling, were collected from 25 strategic locations at a Texas oil rig site chosen by the Bureau of Land Management. These unique sampling and analyses offered enough hydrocarbon data to apply various computer programming techniques to ascertain the most effective parameters in assessing oil pollution.

BOTANY SECTION, Dr. Lionel N. Eleuterius, Head

Salt Marsh Vegetation of Davis Bay (Funded by GCRL): Quantitative information is being accumulated on the relationship of marsh acreage versus open water in this productive estuarine system. In addition, the total area drained by the marsh and the amount of rainfall will be determined in order to study an entire estuarine ecosystem from the plant ecology viewpoint. A detailed vegetative map is being prepared as well as a map of the standing crop of all marshes surrounding Davis Bay. This information is basic to further detailed botanical and ecological studies in the area around GCRL and should provide information for students, scientists and others within the State.

Populational Studies on Salt Marsh Species (Funded by GCRL): This ongoing research is presently concentrated on the salt marsh rush, *Juncus roemerianus*. Considerable population information has been gathered on the species and a portion of it is now in manuscript form. The ultimate goal is to document the distribution and the vegetative growth pattern of the major salt marsh species inhabiting the tidal marshes in Mississippi. Such populational studies are of considerable importance in relation to ecological work since ecotypes (single sexes) may dominate or compose large tracts of tidal marsh. Similar work has been initiated on *Scirpus olneyi* and *Distichlis spicata*.

Ecological Studies on Seagrasses and Salt Marsh Species (Funded by GCRL): Ecological studies on salt marsh species will entail synecological studies where more than one species compose the vegetation. Included in this study is consideration of the hydraulic aspects of flooding of various salt marsh zones to be done in cooperation with the Physical Oceanography Section. Grand Bayou, a high-salinity marsh dominated by *Juncus romerianus* on Deer Island, Mississippi, has been tentatively selected for this portion of the study.

Studies of other ecological aspects of this tidal marsh have been initiated. Tidal inundation and discharge rates can be easily established because of the small, contained ecosystem represented in Grand Bayou. Quantitative data on plant productivity and the nutritive discharge of detritus and other water quality parameters will be assessed on the discharge and on the rising tide.

Autecological Studies on Vascular Plants of Mississippi Salt Marshes (Funded by GCRL): This project is essentially an extension of population studies in that ecological parameters such as soil nutrients, soil-water salinity, elevation, other chemical and physical aspects of the habitats (i.e., soil texture, evaporation), and the life history of the plants will be considered.

Progeny and Genetic Studies on the Salt Marsh Rush, Juncus roemerianus (Funded by GCRL): This work is ongoing research that has been carried out over a number of years. Plants have been grown for several years from seed to obtain Mendelian ratios establishing the genetic mechanism responsible for the sexual distribution found in this rush species. The work constitutes an effort to obtain basic information on this species which dominates Mississippi marshes. During the past year, controlled crosses between known-parental types have been achieved and their seeds are presently being germinated. Hopefully, they will produce mature plants in less than the 2 years required under field conditions.

An apparatus has been constructed in the greenhouse that will extend or shorten the day to induce flowering. Also, experiments have been conducted dealing with the physiological requirement of a cold period, known as vernalization, to induce flowering in this rush. If flowering can be induced, the growth and flowering cycle can be accelerated.

An Illustrated Guide and Key to Salt Marsh Plants (Funded by M-ASGP and GCRL): The purpose of this work is to prepare an illustrated guide and key to the salt marsh plants of Mississippi. It entails about 180 line drawings and scientific descriptions of local species of vascular plants. Keys to families, genera and species are being prepared.

A Phytosociological Study of Horn and Petit Bois Islands (Funded by National Park Service, U.S. Department of Interior): During the first year of this two-year study, a large number of exclosures were established to assess the effect of animals such as nutria, hogs, and rabbits on the vegetation. Concurrently, phytosociological sampling was initiated to obtain information on community composition and successional patterns and interrelationships between the plant communities on these islands. Major products resulting from the work will be maps of large format that will accommodate many detailed vegetational features of Petit Bois and Horn islands. Hopefully, these will be prepared in color. Such color preparations will be of considerable value in the proper management of the islands and invaluable as baseline data for future scientific studies. Considerable effort has been made to obtain information on insular marshes which will be part of general ecological studies on salt marshes in Mississippi. A detailed report, pointing out the special features of these islands, is in preparation.

St. Louis Bay – Botanical Survey and Plant Ecology of Salt Marshes and Submerged Meadows (Funded by Du Pont): Vegetational and community-composition mapping of salt marshes and submerged grass beds as documentation of standing crop, annual production and chemical characterization of indicator plants and associated soils is in progress as part of a baseline environmental study. Continuous recordings of soil-water salinity (isohalines) are being obtained by *in situ* soil-water salinity sensors. Concurrent continuous recordings of light energy from underwater and aerial sensors are also being obtained.

ECOLOGY SECTION, Dr. Robert A. Woodmansee, Head

Phytoplankton Productivity in St. Louis Bay (Funded by Du Pont): Phytoplankton productivity is a fundamental community process of primary significance to the aquatic food chain. It is sensitive to a variety of unnatural environmental perturbations and is affected by a number of naturally occurring variables. Phytoplankton productivity is being measured at six locations in St. Louis Bay by both dissolved oxygen and radioactive carbon techniques and is being related to light intensity, temperature, nutrients, chlorophyll, phytoplankton and grazing pressure.

Environmental Baseline Survey of St. Louis Bay: Benthic Study (Funded by Du Pont): Monthly sampling of benthic infauna and epifauna was initiated in December 1977 as part of an overall effort by the Laboratory to conduct an environmental baseline study in St. Louis Bay. Prior to sampling, equipment was purchased and modified as needed. It was also necessary to hire and train two additional technicians. Beginning in December, 39 infauna and 14 epifauna samples were collected each month and transported to the Laboratory for processing.

Seasonal and Spatial Changes in the Macrobenthos of Simmons Bayou, Mississippi (Funded by GCRL): A benthic study conducted in Simmons Bayou was concluded during this reporting period. From this study, a paper entitled "First Gulf of Mexico Coast Record of *Manayunkia speciosa*" by Walter T. Brehm, was accepted by *Northeast Gulf Science* for publication. Another paper entitled "Seasonal and Spatial Changes in the Macrobenthos of Simmons Bayou, Mississippi," was prepared for presentation at the October meeting of the Gulf Estuarine Research Society.

A Study of the General Plankton and Floating Components of the Water Column from the Surface to 1,200 Meters at Two OTEC Sites in the Northern Gulf of Mexico (Funded by Department of Energy, Ocean Thermal Energy Conversion [OTEC] Program, Lawrence Berkeley Laboratory): Bimonthly cruises aboard the NOAA boat, VIRGINIA KEY, to OTEC sites for the purpose of collecting plankton and general hydrographic data were initiated in June 1978. A sampling program was established to determine the quantity and position within the water column of planktonic species. This project should provide the OTEC Program with some of the necessary biological data for proper design and implementation of an offshore thermal energy conversion plant.

ENVIRONMENTAL CHEMISTRY SECTION, Dr. Julia S. Lytle, Head

Sediment High Molecular Weight Hydrocarbons in Bay St. Louis (Funded by Du Pont): During the past decade there has been an increasing concern over the possible effects of petroleum hydrocarbons in the marine environment. Because of this concern, a great amount of research on the biogeochemisty of these compounds is in progress. National agencies are initiating hydrocarbon baseline studies to be made on areas of potential oil pollution which would be subject to economical and environmental stress. With the building of a large Du Pont plant on the shore of the Bay, hydrocarbon baseline information was essential. To document the present levels of hydrocarbons (aliphatic and aromatic) in St. Louis Bay, 13 sampling stations were used in assessing the hydrocarbon levels from the rivers and from known sites of possible hydrocarbon inputs and also correlated with other sediment studies made at these same stations. Sediments were collected during the first month of the study and hydrocarbon analyses made. These same stations will be sampled during September, nine months after the first collection, and again analyzed.

In an effort to use hydrocarbon data to detect the presence of petroleum pollution, parameters have been derived from gas chromatographic data that indicate the presence of petroleum hydrocarbons. Thirteen of these parameters were measured in all sediments analyzed. Changes can be detected by measuring the same parameters at any later time, thereby establishing both qualitatively and quantitatively the addition of petroleum influx to these sediments.

Studies of Chemical Constituents of Primitive Plants (Funded by GCRL): Chemotaxonomic and geochemical studies continued on primitive plants. Similar studies have been completed previously on ferns, mosses, fungi and lichens. The present study has been extended to include lilies, rushes, sedges and grasses. This study has two purposes. One purpose is to investigate the distribution of biosynthetically related compounds, hydrocarbons and fatty acids, to relate them to a series of ancient plants and to determine what chemical changes took place in the evolution of plants. The other purpose is to establish hydrocarbon and fatty acid distribution patterns that can help in identifying natural-source materials and their environments, and distinguishing them from pollutant sources.

The Fate of Organic Pollutants in Estuaries and Rivers Emptying into the Mississippi Sound (Funded by GCRL and Du Pont): This study is a cooperative effort with the Analytical Chemistry Section. The organic pollutants are isolated and characterized by the Environmental Chemistry Section, and trace metals and nutrients are examined by the Analytical Chemistry Section. The object of the study thus far has been to document the hydrocarbon and total organic carbon levels in St. Louis Bay, Biloxi River and Bay, and the Pascagoula River Systems.

In view of the ever-expanding development of coastal zones, a continuing pollution assessment study is proposed to deal with the following issues of environmental concern:

1. The present condition of Mississippi Sound and adjacent bays and rivers needs careful documentation. Following this, future monitoring efforts can then be determined.
2. The sources of pollutants should be located and dispersal of these pollutants documented. The mechanism responsible for transport and deposition of pollutants in any area of the Sound must be known for various environmental conditions. Fate predictions of materials discharged into the Sound system may then be possible.
3. The public needs to be made aware of present and future dangers of pollution to water resources of the State. Only an informed public can take action to prevent future detriment to the environment and insist upon clean-up procedures.
4. Guidelines for proper development of the coastal zone should be facilitated by a thorough knowledge of impact potential of pollutants at any location in Mississippi Sound.

There will be two distinctly related areas of research. Trace metals to include such elements as copper, cadmium, zinc, nickel, manganese, silver, cobalt, lead and iron will be examined in all sample types used in the study. Their known toxic nature, stability and numerous sources warrant attention in any study. Hopefully, the data gained here will also be useful in predicting the fate of radionuclides as well. Among the organic pollutants to be studied will be hydrocarbons that can result from petroleum pollution. Fatty acids and alcohols, not occurring extensively in petroleum, may be used as tracers of natural organics in the Sound as well as providing additional information on the composition of organic constituents of sediments and water.

Both water samples (surface and bottom) and surface sediments will be collected routinely at each sample site. Since trace metals and organics both are generally associated with fine-grain materials when in a nondissolved state, suspended material will be examined separately from dissolved components and grain-size analysis of sediments conducted. This may provide correlations to clarify sources of deposited pollutants and assess the importance of suspended materials in transporting pollutants. Other studies have indicated the importance of trace metal-organic associations in water and sediments; therefore, this relationship will be examined as closely as possible. Where more appropriate, laboratory conditions will replace natural ones in trying to elucidate the character of this relationship.

Accumulation of Petroleum Hydrocarbons in Clams Taken Near Dredging Operations (Funded by U.S. Corps of Engineers, subcontracted from Micro-Methods, Pascagoula, Mississippi): In order to assess the damage of petroleum hydrocarbons on clams, a study was made to determine the extent of accumulation of petroleum hydrocarbons in clams from two areas, one area off the Florida west coast and the other near Puerto Rico. In doing so, clams from "clean waters" defined the background hydrocarbon distributions while clams from dredging areas defined the input due to mobilization of hydrocarbons from the deposited dredge spoil. Sixty-four samples of clam tissue were analyzed for both aliphatic and aromatic hydrocarbons. Total hydrocarbons in clams were extremely low (less than 1 part per million). Various gas chromatographic parameters were used to help distinguish between biogenic hydrocarbons and those of petroleum origin.

It was apparent that clams taken from various locations accumulated different types of hydrocarbon pollutants according to types of pollutants in the dredging muds. Information concerning sediments and their hydrocarbon distributions is essential to the understanding of the uptake and resuspension of hydrocarbons. We were not given access to this information, thus complete interpretation could not be made.

FISHERIES MANAGEMENT SECTION, Mr. William J. Demoran, Head

Oyster Resource Assessment and Monitoring Segment of the St. Louis Bay Baseline Survey (Funded by Du Pont): The study involves the mapping of existing oyster reefs to determine their present condition as to productivity, natural mortality, spawning and setting, and predators with emphasis on the incidence of one known disease that affects oysters along the Gulf coast. Historical and recent salinity data are being analyzed in order to determine what effect they have had and are having on oyster growth in the Bay.

An Economic, Environmental, Engineering and Legal Assessment of Oyster Depuration in Mississippi (Funded by M-ASGP): This study deals with the managerial aspects of the oyster resource as they might pertain to harvesting and monitoring of oysters as they are processed in the depuration plant.

FISHERIES RESEARCH AND DEVELOPMENT SECTION, Mr. J. Y. Christmas, Head

Fishery Resources Monitoring and Assessment (Funded by NMFS and GCRL): The completion report and manuscript for the original monitoring and assessment project (culminated in September 1976) were finalized and approved by NMFS. The manuscript includes papers covering the principal species in each fishery. The following were considered for each species: immigration; growth; size distribution and abundance collected by various gear types; distribution by habitat, estuarine area, temperature and salinity; seasonal trends in abundance; prediction of abundance; length-weight relationship and condition; and age at maturity.

The current monitoring and assessment project is on schedule. Cooperative efforts to provide data leading to achievement of optimum yield from fishery resources are continuing. Appropriate segments of this work have been closely coordinated with NMFS research in Gulf waters.

Continuing liaison with the Mississippi Marine Conservation Commission (MMCC), M-ASGP, numerous other State and Federal agenices and industry representatives has provided for a progressively improved scientific base for fishery management.

The Mississippi brown shrimp crop for 1978 was adversely influenced by the occurrence of a high-salinity, low-temperature and low-dissolved oxygen watermass that moved through the island passes just before the MMCC opened the Mississippi shrimp season. It was opened in accordance with recommendations based on project data collected for them by GCRL. Catch data were not available but preliminary estimates indicated a good average year for brown shrimp with improved catches expected in July based on the abundance of postlarvae on the nursery grounds.

White shrimp followed typical patterns of abundance with a good crop predicted for late summer and fall harvest. Postlarvae and early juveniles appearing in estuarine nursery areas and available catch data for pink shrimp indicated increasing harvests from Mississippi waters.

Blue crabs were abundant throughout this period and a very large year-class of juveniles were in the sampling area during the 1978 sampling period, indicating that the blue crab population can continue to provide as many hard-shell crabs as processors can handle. However, changes in harvesting regulations may adversely affect production from Mississippi waters.

While total 1977 Gulf menhaden landings were appreciably below those of 1976, landings in Mississippi increased 27% from 1976. Fishing effort in the Gulf purse-seine fishery in 1977 was 8% less than in 1976. Predictions based on juvenile abundance and a 6% increase in effort indicated a good season in 1978. Preliminary catch data indicate that predicted harvest volume will be accomplished.

As expected from the abundant year-classes reported last year, spotted seatrout and redfish provided excellent fishing in Mississippi waters in 1978. After a decrease in numbers caught from the 1976–77 year-class of croakers there was a sharp increase in the 1977–78 year-class moving inshore. Survival of croakers to recruitment in the offshore fishable population continued to be low. Other finfish species followed typical patterns of movement with no evidence of serious problems.

Fisheries Planning (Funded by GCRL): Active participation in fishery planning activities of NMFS, Gulf States Marine Fisheries Commission, the Commission's Technical Coordinating Committee and subcommittees, Gulf State-Federal Fisheries Management Board, Sea Grant Association, MMRC, MMCC, Gulf of Mexico Fisheries Management Council and several professional societies provided for effective input of Mississippi's position in practically all Gulf of Mexico fishery planning activities. Project personnel served as a member of the MMCC.

A regional management plan for Gulf menhaden, completed and published by GCRL last year, was implemented by the Gulf State-Federal Fisheries Management Board. Laboratory personnel served on the menhaden management committee. Scientific and statistical committees for plans being developed by the Gulf of Mexico Fisheries Management Council included several members of the GCRL staff who have acquired expertise in specific fisheries.

Development of a Regional Fishery Management Plan for Gulf Shrimp (Funded by NMFS): *The Shrimp Fishery of the Gulf of Mexico United States: A Regional Management Plan* was completed and published in August 1977. The 128-page document was developed in a series of 11 workshops. The Gulf Shrimp Management Task Force included specialists from each of the five Gulf states and open-meeting workshops were held in each state to facilitate fisherman and industry participation in the planning process. A comprehensive summary of this plan (20 pp) was developed and published in November 1977. The plan was implemented by the Gulf State-Federal Fisheries Management Board early in 1978. Laboratory personnel served on the Board's Shrimp Management Committee.

A Proposed Mississippi Marine Finfish (Selected) Fishery Management Plan (Funded by M-ASGP): This project provides for development of a proposed management plan for selected Mississippi marine finfish in a cooperative effort with the University of Southern Mississippi. A working group comprised of personnel from GCRL, USM, MMCC and Sea Grant Advisory Service, held workshop sessions each month. The MMCC selected ten species for inclusion in the plan and appointed a 12-person Advisory Committee to provide input from recreational and commercial fishermen, processors and consumers. Work is proceeding on schedule.

Environmental Baseline Survey of Bay St. Louis, Nektonic Macrofauna (Funded by Du Pont): This segment of the multidisciplinary study of St. Louis Bay provides for collection and study of the nektonic macrofauna in the Bay. Sampling was started in October 1977 and by the end of June 1978, a total of 252 biological samples and 1,080 physico-chemical measurements had been completed. All samples were processed on schedule and verified data were stored in the Laboratory computer files. About 200 species have been identified from biological samples.

GEOLOGY SECTION, Dr. Ervin G. Otvos, Head

Offshore Barrier Island Study (Funded by GCRL): This is a study of the geologic history, genetic conditions and present state of six Mississippi-Alabama barrier islands. Drilling on western Petit Bois Island was completed in the summer of 1977. Two corcholes drilled in 1978 on western Dauphin Island completed that island's subsurface geological exploration. Five coreholes were drilled in a transect between the mainland and Horn Island. The U.S. Coast Guard and the Mississippi National Guard provided periodic photo coverage of certain critical island sections, allowing the monitoring of changes over a short period of time. Processing of previously acquired core material progressed

in the sedimentation laboratory. Part of the accumulated findings on this island have been organized for a later presentation at a professional meeting as well as for publication.

Santa Rosa Island (Funded by GCRL): Study of this island has started with the acquisition of U.S. Corps of Engineers' drill core material from Birmingham, Alabama, and island drill core material from a testing laboratory in Pensacola, Florida. Comparison between this island and the Alabama-Mississippi barrier islands has major significance in understanding their formation and development conditions.

Origins of Lake Pontchartrain and Surrounding Holocene Areas (Funded by GCRL): Collection and organization of available material continued with the view of publishing in the fall of 1978.

Holocene Geology of Hancock County Marshland (Funded by GCRL): A paper was prepared in conjunction with the Botany Section, based on available data involving floristic aspects of the study area.

Chenier Genesis in the U.S. and Worldwide (Funded by GCRL): A paper has been prepared with the collaboration of Dr. W. A. Price, Corpus Christi, Texas, and accepted for publication in *Marine Geology*.

Beach Sand Analysis (Funded by GCRL): Granulometric analysis was performed on numerous samples for the Physical Oceanography Section.

Shoreline Erosion–Mitigation Assessment and Planning for the Mississippi Gulf Coast (Funded by MMRC): This project was performed jointly with the Physical Oceanography Section. A report on partial results was submitted, but the second stage was not funded.

Pleistocene Development in Southeastern Louisiana (Funded by GCRL): Field and laboratory work continued. Special attention was paid to the Bayou Sara area's (Mississippi-Louisiana) Pleistocene chronological problems.

St. Louis Bay (Funded by Du Pont): Monthly sediment analyses of collected Bay samples were performed on this project.

MICROBIOLOGY SECTION, Dr. David W. Cook, Head

Evaluation of Methods for Long-Term Freezer Storage of Blue Crabs for Use in Picking Plants (Funded by MMRC): An evaluation was made of two procedures for freezing and storing blue crabs until they could be picked. In one procedure, the crabs were given a short cook and then frozen whole with a final cook before picking. In the second process, the crabs were cooked and packed with only the crab cores being frozen. Included in the evaluation were pickability test, lump and total meat yields, bacteriological quality, palatability test, and shelf-life of the picked crabmeat.

Meat picked from crabs which had been frozen by both methods was found to be acceptable to a taste panel in terms of flavor, texture, and appearance. Meat yields were comparable between frozen crabs and fresh crabs picked on the same day. The quality of the lump meat appeared to be unaffected by the freezing process. Bacteriological quality of the meat picked from the frozen crabs was good and the keeping quality of the meat was excellent.

Viral Evaluation of Prohibited Oyster Growing Waters (Funded by M-ASGP): This joint project with the University of Southern Mississippi is designed to assess the relationship between numbers of pollution-indicator bacteria in the water and the level of viruses found in the oysters. GCRL is responsible for water- and oyster-sample collections and bacteriological analysis. Data produced in this project will be available to State and Federal regulatory agencies for use in assessing present-day water quality standards.

Environmental Baseline Survey of St. Louis Bay: Microbiological Investigations (Funded by Du Pont): Water samples from 14 stations in the Bay and adjacent rivers are being collected at 2-week intervals and analyzed for coliforms and fecal coliforms. These data will document the present-day levels of sewage pollution in the Bay. Each month water samples collected at 22 stations are analyzed for microbial biomass using adenosine triphosphate (ATP) methodology. These data will be used to correlate with phytoplankton counts and productivity measurements.

Populations of selected groups of bacteria are being studied in sediments from seven locations around the Bay. Metabolic activity rates and total biomass are being determined.

A Study of the Genus Bacillus in Marine and Estuarine Sediments (Funded by GCRL): The distribution, taxonomy and ecology of the genus *Bacillus* in the estuarine sediments of St. Louis Bay are being investigated. The numbers of *Bacillus* spores found at seven locations in the Bay are being enumerated monthly and the percentage of pigment forms noted. Thirty isolates are being selected from each of three stations monthly for future taxonomic studies.

The Determination of the Acute Toxicity of Dredged Material to Fish and Microinvertebrates under Standard, Static, Bioassay Conditions (Funded by GCRL): Sediment samples collected from the inner harbor and approach channel to the Broadwater Beach Marina in Biloxi, Mississippi, were processed in accordance with U.S. Environmental Protection Agency (EPA) guidelines and tested as toxicants to blue crabs, mysid shrimp, and penaeid shrimp. As stated in last year's report, no deaths were observed with the blue crab, and mysid shrimp mortalities were random and not associated with sediment (toxicant) concentration. During fiscal year 1978, further tests were conducted with brown shrimp. Mortalities were random and not related to sediment concentration.

The information generated by these investigations was utilized by the Broadwater Beach Marina in obtaining the permits required to perform maintenance dredging in their harbor.

Persistence and Degradation of Insecticides in Estuarine Water and Sediment (Funded by GCRL): Investigations

regarding the persistence and degradation of malthion, parathion, methyl parathion, diazinon, and mirex in the estuarine environment were curtailed during fiscal year 1978 to allow time for the other toxicology investigations described elsewhere in this report. Bacterial cultures capable of degrading the organophosphorus insecticides are being maintained for future use.

Insecticide Persistence in Natural Seawater as Affected by Salinity, Temperature, and Sterility (Funded by EPA): This investigation was conducted in conjunction with studies underway at the EPA Laboratory at Gulf Breeze, Florida, in an attempt to more clearly delineate the various biological and chemical factors that determine the recalcitrance of insecticides in the natural environment. This project was actually completed in fiscal year 1977 with the final report being prepared during fiscal year 1978.

MICROSCOPY SECTION, Dr. Harold D. Howse, Head

Studies on Lymphocystis Virions (Funded by GCRL): Studies of lymphocystis tumors continued with the collaboration of the Parasitology Section. Tumors were examined from different species of fishes, several of which were new host species. Diameters of the virions examined in each species were as follows: 387 nm *Pomacanthus semicirculatus*, Koran angel fish; 287 nm *Zanclus canescens*, Moorish idol; 287 nm *Chaetodon capsitratus*, foureye butterfly fish; 259 nm *Platax orfiendaris*, batfish; and 287 nm *Holacanthus ciliaris*, queen angelfish.

Further studies are in progress on cellular response to this viral pathogen in different fish species.

Histological and Cytological Investigation of Various Organs and Tissues of the Atlantic Croaker Micropogonias undulatus (Funded by GCRL): The first phase of a histological and cytological study was begun on the several organ systems and tissues of the Atlantic croaker. Numerous juvenile fish were processed and sectioned in longitudinal and cross-sectional views for selective staining. Additionally, various selected tissues were excised from sexually mature specimens and prepared for comparison of seasonal changes.

The second phase of this project will consist of the preparation of an atlas of normal croaker histology and cytology. The results of this study will provide the basis for determining pathological changes occurring in croakers exposed to various toxicants under experimental conditions.

Fine Structure of the Peritrichous Ectocommensal Zoothamnium sp. (Funded by GCRL): This project, conducted in collaboration with T. G. Sarphie and W. E. Hawkins, University of South Alabama, dealt with a protozoan that attaches to gills of penaeid shrimp. When present in large numbers, these ectocommensals can suffocate commercially important shrimp and cause severe economic problems in aquaculture. The results of this study are presented in a paper now in press.

OYSTER BIOLOGY SECTION, Dr. Edwin W. Cake, Jr., Head

Oyster Spat Monitoring Program (Funded by GCRL): This study concluded 2 years of oyster "spat" monitoring to determine the time and intensity of setting at five locations in Mississippi Sound and adjacent waters. The study also provided information on the setting time and density of major oyster competitors and foulers, such as barnacles. These data collected to date are being provided to oyster culturists who wish to plant cultch material for collecting seed oysters on private leases.

Plankton Sampling for Oyster Larvae (Funded by GCRL): This is the second and final year of a study to monitor the number of oyster larvae in Biloxi Bay plankton as a means of estimating spawning activity and potential spat settlement. The data gathered should assist oyster biologists and the oyster industry in predicting the best time for planting cultch materials.

Oyster Growth and Mortality Study (Funded by GCRL): This is also the last of a 2-year study to determine the growth and mortality rates of various types of seed oysters at five locations in Mississippi Sound and adjacent waters. Oysters reared in lagoons on the barrier islands appear to grow faster and survive better than those "planted" at inshore locations. The reproductive processes for all seed-oyster types appear to be normal for the salinity and temperature regimes at all five locations.

Biological and Ecological Studies of the Oyster Boring Clam (Funded by GCRL): The final year of a 3-year investigation was completed on the basic biology and ecology of *Diplothyra smithii*. Its life cycle has been documented and its burrowing behavior and mechanisms have been observed and documented. Distribution and population dynamic data from Mississippi Sound burrowing clams are being assessed. The reproductive biology including the gonadal, spawning and setting cycles have been documented. Morphological studies of the adult clams have also been completed.

Gametogenesis and Spawning of Mississippi Sound Oysters (Funded by GCRL): During the last year of this 2-year study, monthly and bimonthly gonad samples of oysters from western Mississippi Sound were examined to determine the effects of temperature and salinity on annual spawning cycles. The results of this study should aid in our understanding of the basic reproductive biology of Gulf Coast oysters.

Black Drum Predation on Oysters and Other Invertebrates (Funded by GCRL): This 3-year study was completed during the past fiscal year. It provided the first experimental documentation of the predatory behavior and predation rates for this little-known species. Under experimental conditions, large drum will consume approximately one oyster per-pound-of-body-weight per day. The black drum is, therefore, perhaps the most destructive oyster predator in Mississippi Sound.

Oyster Depuration in Mississippi: Environmental, Legal and Management Assessments (Funded by M-ASGP and GCRL): The first phase of a 3-year study was completed during the past year and the final report will be available to the public during fiscal year 1979. Results of the study indicate that there are no insurmountable environmental, legal, or management problems that would preclude the operation of onshore oyster depuration facilities in Mississippi and Alabama. The study did identify problem areas, including a lack of State regulations that would be required to operate a State-approved depuration plant. Draft regulations are included in the final report for consideration by the Mississippi Legislature and the U.S. Food and Drug Administration.

Oyster Depuration in Mississippi: Engineering Assessments (Funded by M-ASGP and GCRL): The second phase of a 3-year study was initiated during fiscal year 1978 in cooperation with sanitary engineers from Mississippi State University. During the study, a 2-bushel, pilot depuration facility was constructed and operated at the GCRL Oyster Biology Facility on Pt. Cadet in Biloxi. Preliminary results indicate that oyster waste products (feces and pseudofeces) can be removed continually during the depuration process and treated via presently acceptable sanitary methods. This reduces the need for complete daily wash-downs, which are expensive, and energy- and time-consuming.

Off-Bottom Cleansing of Oysters in Mississippi Sound (Funded by GCRL): A 2-year study was initiated during the fiscal year 1978 to compare off-bottom and on-bottom cleansing (relaying) of oysters. New techniques and devices are being utilized in an attempt to reduce loss of relayed oysters during cleansing by holding them in off-bottom, containerized storage. The method holds promise for that segment of the oyster industry which is now relaying oysters to leasing bottoms in approved shellfish waters, and which is suffering considerable oyster losses due to burial, predation, rough handling, etc. This study is expected to benefit the entire oyster industry by increasing harvestable oyster stocks and reducing expenses.

Oyster Mariculture (Funded by GCRL): Current experimental oyster mariculture involving one seed oyster hatchery includes, but is not limited to, the following: out-of-season conditioning and spawning of Mississippi Sound oysters; experimental raceway and tank culture of hatchery-reared seed osyters; engineering design and evaluation of experimental hatchery methods; evaluation of new cultch materials for hatchery-reared seed oysters; the effects of various predators (crabs, black drum, spiny boxfish) on seed oysters; and the feasibility of utilizing natural spatfall to increase seed production using Mahes and shell spat collectors.

PARASITOLOGY SECTION, Dr. Robin M. Overstreet, Head

Parasites of Commercially Important Fishes (Funded by NMFS and GCRL): The project primarily concerns the use of parasites to indicate migratory and feeding behavior of the Atlantic croaker. Feeding habits of several other local finfishes are also being investigated by analyzing stomach contents. The project additionally covers aspects of the effects of selected parasites on their respective hosts.

Handbook of Marine Parasites of the Northern Gulf of Mexico (Funded by M-ASGP and the State of Mississippi): This project terminated in January 1978, resulting in an illustrated guidebook for students and laymen to help them understand some of the common parasites likely to be encountered in local finfishes and shellfishes.

Gulf Coast Survey of Fish and Shellfish for Parasites Pathogenic to the Human Consumer (Funded by the U.S. Food and Drug Administration): The purpose of the project was to survey four finfishes and four shellfishes seasonally from Mississippi, Texas (Galveston) and Florida (Tampa) for ascaridoids, heterophyids, and other parasites of public health importance. Representatives of those parasites found were fed to mice and other mammals to determine their ability to live in or cause pathological changes in the hosts. The project terminated 30 June 1978.

Pathological Effects of Larval Thynnascaris Nematodes in the Rhesus Monkey (Macaca mulatta) (Funded by the U.S. Air Force): The primary purpose of the study was to determine if one of the common larval nematodes (*Thynnascaris* Type MB) causes pathological alterations in the alimentary tract of a monkey.

Studies on Helminths of the Northern Gulf of Mexico Region (Funded by GCRL): A determination of parasites in hosts involved in the above projects as well as other hosts are included in this study. This included life histories of the parasites and the relationships between a parasite and its host.

PHYSICAL OCEANOGRAPHY SECTION,
Mr. Charles K. Eleuterius, Head

Wave Refraction Analysis (Funded by M-ASGP): Loss of life and erosion of valuable waterfront property have been attributable to an adverse wave climate in Mississippi Sound and on the seaward side of the barrier islands. Applying a computer wave-refraction model, utilizing linear-wave theory, to a uniform bathymetric grid of the study area generates refraction diagrams. These diagrams, when interpreted, show the locations of high-energy areas and wave caustics under varying wave climates. This information will be useful in marine navigation, especially to the inexperienced boat operator, and to landowners and engineers in employing methods to prevent further erosion of waterfront property.

Characterization of Tidal Bayou and Development of Statistical Evaluation/Monitoring Techniques (Funded by GCRL): This is a continuing study of a critical area of estuarine systems, the contributary – especially the tidal bayou. To ascertain the most useful parametric statistics to characterize the system, data have been collected for the past 4 years. In addition to establishing baseline statistics, statistical techniques are being developed for monitoring

the bayous for changes that might ordinarily go unnoticed.

Air–Sea Heat Flux (Funded by GCRL): Water temperature is an important factor in the growth and migration of marine species. Attempting to forecast an opening date for shrimping season based on a statistical shrimp size is hampered by the variability in growth rate which is dependent, in part, on the water temperature. This study includes the development of a predictive, stochastic model of heat flux in Mississippi Sound that will provide a means of predicting the thermal structure of the water column when given a set of conditions.

Hydrology of St. Louis Bay (Funded by Du Pont): The objective of this study is the development of an extensive and intensive baseline of hydrographic parameters to serve as an estimate for "normal" conditions. The field data collection effort, which is coordinated with the other disciplines participating in the environmental baseline study, obtains measurements of water temperature, salinity, pH, dissolved oxygen, turbidity and water color. In addition, fixed and automated sampling platforms continuously record wind speed and direction, water elevations, air temperature, photic period, pH, dissolved oxygen, salinity and water temperature.

The continuous records of tides and winds, supplemented by direct-current measurements, will be used to calibrate a mathematical model of water circulation for St. Louis Bay.

The product of the Bay study will be a viable mathematical algorithm of circulation, determination of flushing rate, physical characterization, baseline (norm) of some physical property levels, and quantification of some physical processes.

PHYSIOLOGY SECTION, Dr. A. Venkataramiah, Head

Evaulation of the Nutritional Value of Grass from High Marsh Areas to Brown Shrimp Penaeus aztecus Ives (Funded by MMRC): The objectives of this study were to determine the feasibility of utilizing the high marsh grass *Spartina patens* and shrimp shell waste in shrimp culture as supplementary feeding. The food pellets composed of modified grass with a maximum of 4% protein and shrimp shell waste gave a greater increase in biomass than the pellets composed exclusively of grass. Control pellets produced a slightly better growth than the grass pellets. Shrimp provided with loose grass and shrimp shell waste showed a tendency toward high cannibalism.

The use of microbially modified *Spartina patens* as a food source does not appear feasible, at least in laboratory shrimp culture. With more effective decomposing techniques, high marsh grass may prove useful for the production of detritus in pond culture. Addition of shrimp shell waste to the food appears to improve growth and survival, and warrants further investigation.

Acute Effect of the Simulated Du Pont Effluent on the Survival and Behavior of Penaeid Shrimp (Funded by GCRL): The acute effect of simulated Du Pont waste was tested on the mortality rates, behavioral responses of juvenile brown shrimp *Penaeus aztecus*, during 96- and 144-hour exposure in 10, 20, 35, and 50% effluent concentrations at 80, 86 and 90°F. Control shrimp normally survived during the 96-hour period. A few of the unfed, but not the fed, shrimp died in 144 hours at 86 and 90°F. Survival was good in 50% effluent concentrations except that one death occurred at 90°F in 96 hours. Some of the starved shrimp died at 86 and 90°F. A few of the fed animals also died in 10 and 35% effluent concentrations without showing any correlation between the concentration of effluent and mortality. While high temperature by itself is known to be detrimental to their survival, addition of effluents to the medium may augment the adverse effects at high temperature.

A Literature Research Project on the Lethal Upper Temperature Limits for Coastal Water Fauna (Funded by GCRL): About 400 new references have been added to the existing 1,200 or so previously collected for the purpose of compiling a reference book.

Effect of Simulated Du Pont Effluent on the Physiological Responses of Commercial Penaeid Shrimp (Funded by GCRL): Preliminary experiments were done with a Warburg respirometer to determine the effect on the O_2 consumption in brine shrimp infected with the bacteria, *Leucothrix* sp. With the existing respirometry techniques no significant differences were found between the normal and bacterially infected brine shrimp.

Caloric Densities of some Shellfish Meat Fats (Funded by GCRL): The caloric content of meats of crab, lobster, three species of shrimp, crawfish, oyster and squid was analyzed by oxygen-bomb calorimetry. Whole meat of lobster yielded the lowest calories and that of squid the highest calories. The percentage of fat content in the meats differed significantly; oyster meat has more fat than the other shellfish meats analyzed, and crawfish very low fat.

The caloric content of the extracted fat differed distinctly among the species. Fats of squid and lobster showed very low-caloric energies while fats of oyster, blue crab and pink shrimp showed high-caloric energies. It is suggested that the nature of the lipid classes contributes more toward caloric density of the tissue than the total lipid content.

Size-Related Variations in the Tissue Cholesterol Content of the Brown Shrimp Penaeus aztecus Ives (Funded by GCRL): Muscle (tail) cholesterol increased linearly as body weight increased among female shrimp, whereas males maintained a steady level independent of size. Based on these findings, it is suggested that the bulk of marketable shrimp, 60–68 heads-on count/pound, have relatively lower cholesterol levels than is reported in nutritional and medical literature. Compared to caviar, organ meats, brains and eggs, shrimp muscles showed a low cholesterol content.

Effect of Cooking and Frozen Storage on the Cholesterol Content of Selected Shellfish (Funded by GCRL): Cooking decreased the cholesterol content of crabmeat but

brought about no significant change in shrimp or oyster meat levels. Freezing and thawing of raw tissue increased cholesterol content of oyster and shrimp meats but did not affect the level in crabmeat.

Lipid and Sterol Levels as Indices to Determine the Optimum Harvestable Size in Crassostrea virginica (Gmelin) (Funded by GCRL): The lipid content of the meat was directly related to size on a logarithmic scale and was independent of sex. The relationship between total sterol content and weight of oysters was nonlinear. Adult males show higher sterol content than females. It is suggested that oysters with an 8 to 10 g meat weight or 95 to 100 mm shell length would be ideal for harvest because oysters in that size range have low sterol and triglyceride levels.

SYSTEMATIC ZOOLOGY SECTION, Mr. C. E. Dawson, Head

Systematic Studies on Fishes of the Families Microdesmidae, Dactyloscopidae and Syngnathidae (Funded by the National Science Foundation): Studies on three families of fishes continued throughout the year. Revisionary studies on the pipefish genera *Penetopteryx* (and relatives), *Hippichthys* and *Bhanotia* were completed. Revisions of *Oostethus, Doryichthys* and related genera, as well as reviews of the western Atlantic pipefishes (Syngnathidae) and sand stargazers (Dactyloscopidae), also continued throughout the year. In connection with these problems, studies were conducted on fishes at the California Academy of Sciences and National Museum of Natural History.

SPECIAL FACILITIES

MARINE EDUCATION CENTER, Mr. Gerald C. Corcoran, Curator

Visitations to the Marine Education Center increased from 23,844 in fiscal year 1977 to 39,155 in fiscal year 1978. While some of the increase may be attributed to the opening of the new Gulf Marine State Park, the majority must be considered as normal average yearly increase.

In cooperation with the M-ASGP, four workshops in marine science were conducted for inland teachers. These were held in Oxford and Jackson, Mississippi, and Huntsville and Montgomery, Alabama. Emphasis was placed on the use of inland facilities in conducting classes in marine education. The primary aim of the workshops was to acquaint teachers with the concept that "marine" is now generally accepted as referring to water in general and not necessarily salt water. Approximately 120 teachers attended the workshops.

At the request of a Slidell, Louisiana, parents group, a course in marine science for gifted children was written. The presentation of the course took place in July 1978. Subjects covered were coastal geography, the Gulf of Mexico as a habitat, diversity of marine life, water mammals and identification of selected specimens. Field trips were scheduled to augment and supplement classroom discussion.

The ongoing marine science courses for teachers had a total enrollment of 44 students, 26 in the basic course and 18 in the advanced course. As in previous years, enrollment included people in occupations other than teaching. Included were one Navy commander, one chemist, two Air Force retirees, one Veterans Administration Hospital employee and three housewives.

A slide program and field trip to Horn Island were conducted for a class of teachers from Tougalou College. This was another attempt to introduce marine science to inland teachers. Eight students were involved, and, although the study consisted primarily of saltwater animals, the students were instructed in the general characteristics of plants and animals. Techniques for adapting the information to fresh water were emphasized.

The student-intern program was continued with two students from Gulfport and one from Biloxi participating. Students were given credit through their schools for advanced biology. Subjects covered were identification of animals, care and maintenance of captive specimens, and preservation.

The special educational program for Creative Learning in Unusual Environments groups from Memphis, Tennessee, was conducted again this year with a total of six groups taking part. This program is growing each year. The Whitehaven Methodist Day School, Memphis, took advantage of the program by bringing a group to the Center for the fourth consecutive year. The Marine Education Center makes arrangements for these groups to attend Marine Life in Gulfport, tour the Biloxi harbor, and go seining on the beach at night, in addition to their visit to the Center exhibits.

Two Explorer Posts in Environmental Science were formed during the year under the auspices of the Boy Scouts of America program. Programs such as water sampling techniques and fish identification were presented. Center personnel continued to act as merit badge counselors to the Boy Scouts of America on 16 different merit badges. The Explorers were taken on field trips to the local beach for collection of specimens and water samples. Equipment and literature at the Center were utilized to conduct programs for the Scouts. Future plans call for a session on ecology with a possible trip to Horn Island to study a special ecological habitat.

Three radio programs on marine-related subjects were presented in cooperation with radio station WGCM in Gulfport. The topics included sharks, poisonous marine animals and local snakes. Two programs, in cooperation with the Public Information Section of the Laboratory, which included aquaria of horseshoe crabs and a film showing, were conducted for local libraries in Pascagoula and Moss Point, Mississippi.

Consultations continued between the Marine Education Center and Marine Life, Inc. of Gulfport. The veterinarian responsible for administering to marine mammals at Marine Life has been assisted on several occasions by Center personnel. Local pet shops utilize the services of the Center in dealing with outbreaks of diseases in their aquariums.

Visitors request, and are provided, information concerning correct aquarium maintenance procedures, fish diseases and snake handling. Local hospitals routinely send snakes to the Center for positive identification prior to dealing with snake bite cases. One out of two snakes proved to be poisonous during the past year.

The Marine Education Center contributes to the publication of the National Marine Education Association entitled *Current* and the Curator edits a monthly newsletter, *Lateral Line*, published by the North American Native Fish Association. Mr. Corcoran was selected as "Conservation Educator of the Year" for the State of Mississippi by the Mississippi Wildlife Federation.

THE GUNTER LIBRARY, Mr. Malcolm S. Ware, Senior Librarian

A record amount of binding was done this year with long backruns of 39 journal titles being bound. Nineteen monographs were also bound. A number of rare and out-of-print titles were secured, among which were three notable titles: Gurney's *British Fresh-Water Copepoda* (in three volumes); Moore's *Condition and Extent of Natural Oyster Beds . . . Mississippi and Alabama*; and *The Microtomists (Vade-Mecum)*. Another important purchase was a backrun of the *Discovery Reports* on microfiche, purchased from E. P. Group of Companies in England.

Backruns of journals were strengthened in 49 titles. Thirty-nine new journals were added, 21 as standing orders. Two new sections were established within the collections; i.e., Environmental Impact Statements, and the Piatt Reprint Collection.

Four hundred fifty books were purchased during the year, and donations further strengthened library holdings. Dr. B. H. Atwell of the Earth Resources Laboratory, Slidell, Louisiana, donated runs of journals in ten titles, 36 books and 60 reprints. Dr. P. A. Isaacson of the Department of Public Services, Albany, New York, donated 549 scientific papers which included some journal numbers. Dr. R. E. Baglin, Jr., of National Marine Fisheries Service, Miami, Florida, donated books and reprints numbering collectively 280. Staff members making donations to the library included Drs. David W. Cook, Gordon Gunter, Harold D. Howse, Ervin G. Otvos and Mr. John P. Steen, Jr.

Five hundred thirty-six reprints were cataloged and shelved, adding to the approximate total of 20,000 processed reprints. (There are still an additional 5,000 to 8,000 unprocessed reprints backlogged.) The book cataloger processed about 500 books (October–June) bringing the cataloged portion of the book collection up to about 35% of the total. Incoming interlibrary loans numbered about 196 and more than 70 items were loaned out to other libraries. A year-end survey revealed that the new card catalog and microfilm filing cabinets were 65% filled. The microfiche system was 25% filled in its present mode.

Visiting researchers used the Gunter Library in increasing numbers this year, coming from three laboratories at Dauphin Island and the Pascagoula fishery station. Other visiting researchers were from various Mississippi and Alabama colleges and universities, as well as from local and regional agencies such as Geo-Marine, Richardson, Texas; National Space Technology Laboratory, Bay St. Louis; Ingalls Shipbuilding Division of Litton Industries, Pascagoula; and Jackson County Planning Commission, Pascagoula. During the fall and spring, field-trip groups from affiliate schools used the collection on a one- and two-week basis. In addition, a record number of science fair students came to the library from the junior and senior high schools of the six coastal counties. Also, college-level students enrolled in continuing education courses at the Marine Education Center and on the main campus, used the library every quarter. Throughout the year various researchers, both U.S. and foreign, were hosted on a "walk-in" basis.

ICHTHYOLOGY RESEARCH MUSEUM, Mr. C. E. Dawson, Head

Four hundred twenty-two lots, representing approximately 5,000 specimens were cataloged.

An important collection of fishes by the R/V OREGON off the coasts of Venezuela and Brazil was received from the NMFS. Gifts of specimens, including a number of pipefishes, were received from several U.S. and foreign institutions. The Museum now houses one of the world's most comprehensive collections of pipefishes.

Loans of specimens were made to a number of U.S. and foreign institutions. Identifications were provided for fishes sent by investigators in the U.S., Central and South America, Europe, Australia, etc.

WATER ANALYSIS LABORATORY, Dr. Thomas F. Lytle, Head

The Water Analysis Laboratory has processed samples for the sections of Physical Oceanography, Microbiology, Oyster Biology, Botany, Anadromous Fishes; for the Du Pont project and the Mississippi Air and Water Pollution Control Commission. These analyses have included: orthophosphate, total phosphorus, nitrate, nitrite, ammonia, sulfate, silicate, chloride, turbidity, suspended solids, alkalinity and chlorophyll, and phaeophytin. In all, 2,635 analyses have been performed (excluding those for the Du Pont project). Many of the analytical schemes have been modified to comply with Federal guidelines. In addition to actual analyses, staff of the Water Lab have advised other section members and persons outside the Laboratory on matters of pollution, water-quality criteria, sample collection, etc. Some of the teaching for the Laboratory's courses, Special Problems in 1977 and Special Topics in 1978, was handled by Water Lab personnel.

COMPUTER SECTION, Mr. David Boyes, Head

Several significant events occurred during the year. Foremost was the use of on-site data retrieval systems for scientific analysis. Production run time, the actual amount of time the computer is used for analysis, increased to 75%

of total run time, the amount of time the computer was in operation. Work on multidimensional statistical analysis and graphical programs departed from the development stage and entered the test-and-application stage.

The training program for section personnel has proven to be an effective tool for increasing the performance of the Computer Center. Tasks that could only be performed by one individual can now be undertaken and accomplished (with a small loss in overall efficiency) by another member of the section. The net result is a decrease in computer down-time.

The total number of jobs, programs run on the computer, for the year was about 2,266, which required a total of 1,084.69 hours. The following projects (sections) were the main users: Fisheries, 386 jobs; Du Pont project, 386 jobs; Finance, 310 jobs; Graduate program 289 jobs; Oceanography, 250 jobs; Botany, 98 jobs; Systematic Zoology, 94 jobs; and Parasitology, 59 jobs.

PUBLIC INFORMATION/PUBLICATIONS SECTION

Miss Catherine Campbell, Head

News releases were sent to 50 selected daily and weekly newspapers, television and radio stations, wire services and special correspondents. In addition, pictures of field-trip groups and summer college students were made and sent to hometown and campus publications. A general article on the Laboratory was furnished the *Mississippi Press Register* (Pascagoula) for a special edition printed in March. Assistance was also provided to outside writers, photographers and television crews in obtaining interviews with members of the Laboratory staff.

A 4-day open house was planned and held November 9–12, 1977. The first three days were devoted to junior and senior high school science students and about 530 students and teachers participated. The final day, Saturday, was for the general public and over 650 visitors attended. Not all interested science classes could attend open house and they requested Laboratory tours at other times, including six college and eight secondary school groups.

Through visits to public libraries in the coastal communities, in June 1978 the Section began a new public information program entitled "What's in the Gulf for you?" This was planned originally as a summer activity, however, it will be continued as long as interest warrants. Depending on the size and hours of the libraries visited, staff members of the Section and of the Marine Education Center spend up to 7 hours on a visit. The Marine Education Center also provides an aquarium with a live horseshoe crab for the visits. Color slides explaining the processing of seafood in local plants and a 16-mm sound film "World Beneath the Sea" are shown; Marine Education Leaflets, tide tables, shark recipes, marine career information, and other free materials are distributed. Visitors and library personnel are made more familiar with the programs and activities of the Marine Education Center, the Laboratory, and its publications.

From July 1, 1977 until January 8, 1978, the Section produced 19 new 15-minute "On Course" radio programs and 9 rerecorded programs. Programs were broadcast by nine radio stations along the coast and in Meridian and Jackson. In January, after completing 2 full years of broadcasts, the Section began a year's vacation from the radio series.

Living Science Comments, a new program, was undertaken at the request of the Director to preserve for future generations the voices and comments of outstanding scientists. Two recordings have been made, the first of Dr. Gordon Gunter of this Laboratory, and the second of Dr. J. Frederick Walker, former professor at the University of Southern Mississippi, now retired. Master tapes will be maintained and duplicated as needed.

Color slides and black and white pictures were made of field sampling activities in connection with the environmental baseline survey of the Bay of St. Louis, conducted by the Laboratory for Du Pont. A slide program is to be assembled with narration; black and white prints were used in *Marine Briefs*, GCRL's monthly newsletter. Additional color slides were made in crab processing plants for the cooperative seafood industry program series and the narration was revised.

For the first time class pictures were taken for the summer courses taught at the Laboratory. Students and professors were given an opportunity to purchase prints and others will be available in an album in the Gunter Library.

The Section staff provided Laboratory participation in the Mississippi State University-sponsored Harrison County Fair at Edgewater Mall Shopping City in September 1977; also, in the Mississippi Academy of Sciences annual meeting exhibits in Biloxi during March 1978.

Copy was edited and set in page format and illustrations prepared for printing the December 1977 issue of *Gulf Research Reports*, Volume 6, Number 1. Finished copies were received in April and 758 copies were mailed by the staff. The issue contained seven regular papers, six short communications and the Director's summary report of Laboratory activities. After materials for this issue went to the printer, work began on the next issue, Volume 6, Number 2.

Similar publications work was performed by the staff on the *Technical Report Series*. Number 2 of the series, *The Shrimp Fishery of the Gulf of Mexico United States: A Regional Management Plan*, was published in August 1977. *Technical Report Series*, Number 2, Part 2, a condensed form of the management plan, was published in November 1977. Distribution of both was handled primarily by Mr. J. Y. Christmas, Assistant Director of the Laboratory for Fisheries Research and Management, who served as co-editor with Dr. David Etzold of the University of Southern Mississippi.

Section personnel wrote and edited copy, took photographs, set copy and made layouts for 12 monthly issues of

Marine Briefs, the Laboratory newsletter. This was the seventh year of publication; about 3800 copies are distributed regularly.

ACADEMIC PROGRAM

NEW AFFILIATE

One institution became affiliated with the Laboratory during the year for the purpose of training its students in the marine sciences, bringing the total of out-of-state affiliates to 38. This new affiliate is Middle Tennessee State University, Murfreesboro, Tennessee.

SUMMER SESSION, Dr. David W. Cook, Registrar

The 1977 summer academic session involved 91 students registering individually for a total of 125 student courses. Forty-nine students registered through Mississippi schools, 65 through out-of-state affiliates and 10 through nonaffiliated out-of-state institutions. Formal courses offered during the 1977 session were:

Marine Chemistry, Drs. Julia S. Lytle and Thomas F. Lytle, staff
Salt Marsh Ecology, Dr. Lionel N. Eleuterius, staff
Physical Marine Geology, Dr. Ervin G. Otvos, staff
Chemical Marine Geology, Drs. Ervin G. Otvos, Julia S. Lytle, and Thomas F. Lytle, staff
Marine Microbiology, Drs. David W. Cook and William W. Walker, staff
Introduction to Marine Zoology, Dr. Buena S. Ballard, Southwestern Oklahoma State University
Marine Vertebrate Zoology and Ichthyology, Dr. J. William Cliburn, University of Southern Mississippi
Marine Invertebrate Zoology, Dr. Edwin W. Cake, Jr., staff
Marine Fisheries Management, Mr. J. Y. Christmas, staff, and visiting specialists
Marine Aquaculture, Dr. Edwin W. Cake, Jr., staff
Marine Ecology, Drs. James T. McBee and Robert A. Woodmansee, staff
Marine Botany, Dr. R. B. Channell, Vanderbilt University
Special Problems in Marine Science, staff

During the 1977–78 academic year, 44 students earned credit in courses in marine science for teachers that were offered through the Marine Education Center located in Biloxi. Courses offered were:

Basic Techniques in Marine Science for Teachers, Mr. Gerald C. Corcoran, staff
Advanced Studies in Marine Science for Teachers, Mr. Gerald C. Corcoran, staff

GRADUATE RESEARCH PROGRAM

Courses offered in the Graduate Research Program during this period in which students participated included: Seminar, Special Problems in Marine Science, Special Topics in Marine Science and Graduate Research in Marine Science. A total of 101 semester hours credit were earned by these students.

The Graduate Research Program has seen significant growth during the year with the addition of seven new students. One student completed his degree and four students have completed their research projects and returned to their parent campuses for further coursework. Fourteen students in the program were candidates for the master's degree and eight candidates for the doctorate.

Each candidate's name, thesis title, degree sought and home university are listed below according to research sections directing their work:

Anadramous Fishes Section: William W. Falls, "Food habits and feeding selectivity of larval striped bass, *Morone saxatilis* (Walbaum), under intensive culture," Ph.D., University of Southern Mississippi.

Analytical Chemistry Section: Leo N. Richard, "The presence of aromatic hydrocarbons and bena(a)pyrene in Mississippi Gulf Coast oysters," M.S., University of Mississippi.

Botany Section: James C. Garrison, "Some relationships of salt marsh vegetation to abundance of the marsh periwinkle *Littorina irrorata* Say," M.S., University of Mississippi.

Stephen H. Sky-Peck, "A study of growth and nitrogen content of *Spartina alterniflora* and *Juncus roemerianus* in response to source and concentration of nitrogen," M.S., University of Mississippi.

Ecology Section: Jerry A. McLelland, "The summer vertical distribution of Chaetognatha in the northeastern Gulf of Mexico," M.S., University of Southern Mississippi.

John P. Steen, Jr., "Factors influencing the spatial and temporal distribution of selected crustacean plankton species in Davis Bayou," Ph.D., University of Mississippi.

Michael C. Torjusen, "The occurrence of planktonic larval and postlarval fishes in waters of the northern Gulf of Mexico and the Mississippi Sound," M.S., University of Mississippi.

Oyster Biology Section: David H. Barnes, "Polychaetes associated with an artificial reef in the north central Gulf of Mexico," M.S., University of Southern Mississippi.

David A. Blei, "A successional study of the hydrozoans inhabiting an artificial reef in the north central Gulf of Mexico," M.S., University of Southern Mississippi.

Neil Cave, "Predator-prey relationships involving the American oyster, *Crassostrea virginica* (Gmelin), and the black drum, *Pogonias cromis* Linnaeus, in the Mississippi Sound," M.S., Southeastern Louisiana University.

Alfred P. Chestnut, "Substrate competition between *Crassostrea virginica* (Gmelin) and associated sessile marine invertebrates," Ph.D., University of Southern Mississippi.

John D. Demond, "Amphipod fouling of an artificial reef in the north central Gulf of Mexico," M.S., University of Southern Mississippi.

Katherine A. McGraw, "A comparison of the growth and survival rates of hatchery-reared and natural oyster spat at

selected locations in the Mississippi Sound and adjacent waters with comments on the biology of oysters in Mississippi," Ph.D., University of Washington.

John E. Supan, "A comparison of 'off-bottom' relaying oysters in the Mississippi Sound," M.S., University of Southern Mississippi.

Parasitology Section: Daniel R. Brooks, "Systematic studies on the digenetic trematodes of crocolilians with emphasis on the family Acanthostomidae," Ph.D., University of Mississippi.

Thomas L. Deardorff, "Nematodes of the genus *Thynascaris* Dollfus 1933, (Anisakidae) in the northern Gulf of Mexico," Ph.D., University of Mississippi.

Alan C. Fusco, The life cycle and development of *Sirocamallanus* sp.," M.S., University of Southern Mississippi.

Tom E. Mattis, "Larval development of two trypanorhynch tapeworms from Mississippi Sound," Ph.D., University of Southern Mississippi.

Mobashir Ahmad Solangi, "Pathological changes in some estuarine fish exposed to crude oil and its water-soluble fractions," Ph.D., University of Southern Mississippi.

Physiology Section: Ann L. Gannam, "Effect of replacing dietary animal protein with plant protein supplemented by methionine on the growth and survival of Penaeid shrimp," M.S., University of Southern Mississippi.

Shiao Yu Wang, "Studies on the effect of size and temperature on the respiration rates of brown shrimp, *Penaeus aztecus* Jues, in declining oxygen tension," M.S., University of Southern Mississippi.

Zubir Bin Din, "The food and feeding habits of the common bay anchovy, *Anchoa mitchilli diaphara* Hildebrand," M.S., University of Mississippi.

SCIENTIFIC FIELD TRIP PROGRAM

As an adjunct to the teaching program, each year the Laboratory provides living accommodations, classroom laboratories, and essential services to visiting scientific field trip groups made up of college and university students and their professors. Such groups may stay for periods of up to several weeks, live in the dormitory, use Laboratory boats to make collections of marine life from the sea and from the beaches of offshore islands, and study their specimens in the classroom laboratories. During fiscal year 1978, the Laboratory was visited by 36 of these field trip groups. The total number of people involved were 537 professors and students who stayed an average length of 3.66 days. Some came as far as 2,000 miles to study the marine life of the Gulf of Mexico.

SPECIAL AND COMMUNITY SERVICES

FISHERY ASSISTANCE

A mixing chart for solutions made from 65% available chlorine dry compound was drawn up and distributed to seafood plants. A request had been received to establish the mixing ratios necessary to formulate 30-gallon quantities of 50-, 100-, and 200-ppm chlorine solutions for use in seafood plant operations. The charts were printed on waterproof paper. These charts were to take the guesswork out of formulating the three solutions.

A file of seafood regulations from the southeastern states was assembled. Frequent requests for specific information concerning out-of-state regulations are received from processors shipping seafood across state lines.

Visits to three Virginia seafood processing plants were arranged at the request of a Biloxi seafood packer. The Virginia plants briefly steam their oysters before they reach the shuckers. This causes the shell to open slightly, making it easier to cut out the meat, which increases the percentage of whole oysters to cut ones. The Biloxi packer was interested in introducing such a process in his plant if the process proved favorable, which it did.

Seafood Newsletter (Funded by GCRL): A monthly newsletter designed for seafood management personnel was established under the title *The Biloxi Schooner* honoring sailing vessels used in Mississippi's early seafood industry. The publication contains articles of pertinent information gathered from trade journals and scientific publications; Federal government publications; and notes taken at seminars, conferences, and trade conventions. The contents are technical and designed to be of practical benefit to those in the seafood business. Sixty copies are currently being printed and mailed to the industry.

Reorganized Mississippi Seafood Laws (Funded by GCRL): Mississippi's seafood laws were rewritten in simpler language for clarity; related regulations were grouped for better organization, and the two sets of laws were combined into a single text. This was done because the seafood industry has long had problems with understanding the regulations as they were originally published. The project's final draft was reviewed by the Mississippi State Board of Health after which copies were printed and mailed to the State's seafood processors.

Product Fact Sheet—Oysters (Funded by GCRL): At the request of the Mississippi Shellfish Packers, Inc., a Product Fact Sheet was written. Processors were having continuous problems with shipments of oysters being mishandled by distributors and retailers. Some type of educational material was needed to inform persons on how to care for oysters after they leave the processing plant. The Product Fact Sheet included information on the nutritional value of oysters, coloration variatons, and how to properly handle and merchandise them in commerce.

The Product Fact Sheet was composed in a photo-ready format and given to the president of the Mississippi Seafood Packers, Inc. Copies were to be printed and supplied to members for inclusion in shipments of iced oysters. It is hoped that distributors and retailers will read the sheet as they open the boxes. This information should help improve the shelf life of the product and reduce time and revenue

lost by the industry in picking up spoiled oysters from retail outlets.

Surveys were made on oyster beds at Gollott Oyster Farm to collect oysters for bacteriological studies, to check the salinity of the water over the bed, to count the number of oyster drills (conchs) on it and to establish the percentage of dead oysters resulting from oyster relaying operations.

It was the first year that the MMCC had issued private oyster leases to individuals or corporations. In these areas of good water quality, polluted oysters may be kept until they cleanse themselves, which takes about 15 days.

A trip was organized for several local seafood processors to attend a workshop for seafood retailers that was held in New Orleans. Afterward, a number of copies of the speaker's publication, *Operations Manual for the Seafood Retailer*, were ordered and distributed at their request to processors who could not attend.

A seafood processor was assisted in locating a safe, approved food preservative for trial use in packaged oysters.

Owners of two seafood retail markets requested and received assistance in evaluating their facilities. A list of suggestions was drawn up that would hopefully lead to an increased sales volume.

An oyster processor was assisted with the evaluation and selection of automatic packing equipment to be used in a planned plant expansion.

SEAFOOD SANITATION

Seafood Sanitation Program (Funded by GCRL): At the request of processors, the Microbiology Section makes plant inspections and collects samples for bacteriological testing to determine any problem areas. Suggestions are made for correcting any deficiencies noted in plant sanitation practices.

The program "In-Plant Sanitation–Crab Processing Plants," developed last year, has been upgraded and presented in several local plants to assist in the education and training of plant personnel.

During the fiscal year, 303 crabmeat and 222 oyster samples were collected and analyzed for aerobic plate, coliform and fecal coliform counts. In addition, all crabmeat samples were checked for *Escherichia coli*. This required over 800 hours of laboratory testing. Personnel traveled over 1,500 miles in collecting samples, visiting plants for evaluation and presenting programs.

ENVIRONMENTAL AFFAIRS COMMITTEE

This Committee is composed of all the senior scientific staff members at the Laboratory and is coordinated by the Ecology Section. The Committee provides an interdisciplinary approach to environmental problems in the wetlands and estuaries of Mississippi, primarily as a service to the MMRC, which partially funds this work. However, this Committee also cooperates with other State and Federal agencies on special projects that are not under the direct jurisdiction of the MMRC. The majority of this work deals with the review of permit requests for work proposed in the wetlands and estuaries. Committee members are asked for their comments and recommendations on each permit request. In most cases a site visit is made by representatives of the Committee. Based upon these inputs, a letter to the MMRC is drafted stating any objections the Committee may have, reasons for these objections and recommendations that may reduce or eliminate the objectives.

The Committee reviewed some 110 permit applications throughout the year. In addition, an environmental evaluation of an industrial discharge in Mississippi Sound was conducted and benthic samples were taken and processed for U.S. Fish and Wildlife Services personnel evaluating potential spoil areas for modification of the Pascagoula Ship Channel. Several members of this Committee were also involved in meetings with the Mississippi Air and Water Pollution Control Commission in conjunction with the Jackson County 201 Plan.

PUBLIC SEMINARS

The Gulf Coast Research Laboratory hosts a series of staff seminars throughout the year. These seminars are open to the public and speakers include invited scientists as well as officials from various levels of Local, State and Federal Government. The central purpose of the seminars is to promote better dissemination, understanding, and use of scientific information at all levels of society. Seminars presented during fiscal year 1978 were as follows:

"Current Research Efforts at E.P.A. Laboratory, Gulf Breeze, Florida" by Dr. D. R. Nimmo, U.S. Environmental Protection Agency, August 16, 1977.

"Water Hyacinth for Waste Water Treatment" by Mr. Bill Wolverton, Senior Research Scientist, National Space Technology Laboratory, September 20, 1977.

"Fishery Management in Mississippi–Its Progress and Needs" by Dr. Richard Leard, Director, Mississippi Marine Conservation Commission, October 4, 1977.

"Ectoparasites; Life on Man" by Mr. Alan Fusco, Parasitology Section, Gulf Coast Research Laboratory, October 18, 1977.

"Jellyfish Toxins: Mechanisms of Action" by Dr. Paul M. Toom, Associate Professor of Chemistry, University of Southern Mississippi, November 8, 1977.

"Effects of Slave Trade on Parasite Dispersal" by Mr. Tom Deardorff, Parasitology Section, Gulf Coast Research Laboratory, November 22, 1977.

"Antarctic, Land and Sea–Its Terrestrial and Marine Life" by Dr. Stephen Shabica, Research Oceanographer, National Park Service, December 6, 1977.

"Sharks and Stingrays in the Northern Gulf of Mexico" by Mr. Tom Mattis, Parasitology Section, Gulf Coast Research Laboratory, December 13, 1977.

"Bivalve Molluscan Resources and Problems along the U.S. Pacific Coast" by Dr. Ken Chew, Professor, University

of Washington College of Fisheries, Seattle, Washington, January 9, 1978.

"Field Experimental Studies of Benthic Invertebrates in Florida" by Dr. David Young, Head Chemical & Biological Branch, Naval Oceanographic Laboratory, January 10, 1978.

"Toxic and Sublethal Effects of Pentachlorophenol to Crustaceans" by Dr. Ranga Rao, Department of Biology, West Florida State University, January 24, 1978.

"Reminiscences on the Development of the Shrimp Fishery and Shrimp Biology on the Gulf Coast of the United States" by Dr. Gordon Gunter, Director Emeritus, Gulf Coast Research Laboratory, February 7, 1978.

"Seasonal Changes in Macrobenthic Communities off the Columbia River" by Dr. Michael Richardson, Naval Oceanographic Research and Development Activity, National Space Technology Laboratory, February 14, 1978.

"Developmental Plans for Gulf Islands National Seashore" by Mr. Noel J. Pachta, Assistant Park Superintendent, Gulf Islands National Seashore, February 28, 1978.

"Electron Microscopy in Aquatic Pathology" by Dr. William E. Hawkins, Department of Anatomy, University of South Alabama, March 14, 1978.

"Polymers for Energy, Environment and Humanitarian Concerns" by Dr. C. McCormick, Department of Polymer Sciences, University of Southern Mississippi, March 28, 1978.

"Oyster Culture in the State of Washington" by Ms. Katherine A. McGraw, Oyster Biology Section, Gulf Coast Research Laboratory, April 4, 1978.

"Diversity of Form and Colour in Gulf Coast Amphipod Crustaceans" by Dr. E. L. Bousfield, National Museum of Natural Science, Ottawa, Canada, April 11, 1978.

"Copepods: Both Near and Far" by Mr. John Steen, Ecology Section, Gulf Coast Research Laboratory, April 25, 1978.

"Fishery Product Inspection Perspective" by Mr. Spencer Garrett, Director, National Seafood Quality and Inspection Laboratory, May 9, 1978.

"Land Use and Population Patterns" by Mr. Claude Pittman, Gulf Regional Planning Commission, May 30, 1978.

"Successional Changes in Ichthyofauna of a New Artificial Reef" by Mr. Ron Lukens, Anadromous Fishes Section, Gulf Coast Research Laboratory, June 6, 1978.

"Coastal Zone Management Program" by Mr. J. E. Thomas, Director, Mississippi Marine Resources Council, June 20, 1978.

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